REMARKS

This communication is in response to the Final Office Action of September 25, 2008.

Claims 1-32 are pending in this application. Claims 1, 10, 16, 27, and 30 have been amended to more specifically point out and distinctly claim the subject matter of the invention.

Specifically, Claim 1 has been amended to clarify that the VBR and CBR controllers are "video" controllers and to clarify that the selector is configured to "receive independent calculations of said first quantization step size and said second quantization step size for the current picture from the VBR video controller and the CBR video controller". Dependent Claim 7 has been amended to depend from Claim 5. Claim 30 has been amended similarly to Claim 1. Claim 27 has been amended to clarify that the "changes in the average bit rate of an output bitstream of said encoder" are measured "over time for a current picture" and to include the limitation that "a target bit allocation for said current picture" is adjusted "by second-order feedback control based on said changes". Dependent Claim 29 has been amended accordingly. Claim 10 has been amended to include the limitation of an "activity-based energy value for each macroblock type indicative of a number of bits required to encode each macroblock type". Dependent Claim 12 has been cancelled and dependent Claim 13 has been amended accordingly. Claim 16 has also been amended similarly to Claim 10. Dependent Claims 17 and 18 have been amended accordingly. Support for the amendments is found throughout the specification, and in particular, at paragraphs [0023], [0024], [0025], [0034], [0035], [0036], [0037], [0060], and [0062]. No new matter has been added.

Claims 27-29 have been rejected under 35 U.S.C. § 102(e) as being anticipated by Ribas-Corbera, U.S. Patent No. 6,535,251 ("Ribas-Corbera"). Applicants traverse the rejections. Reconsideration of these claims is respectfully requested.

Applicants respectfully submit that Ribas-Corbera does not disclose "measuring changes in the average bit rate of an output bitstream of said encoder over time for a current picture" and "adjusting a target bit allocation for said current picture by second-order feedback control based on said changes".

As described in the Specification, "the VBR rate controller 280 creates a target bit allocation by measuring changes in the average bit rate of the output bitstream over time, e.g., by tracking instantaneous and cumulative deviations between the actual and target long-term average bit rates and re-adjusting the target bit allocation accordingly". (Specification, paragraph [0024]).

The changes in the average bit rate are described in paragraph [0060] of the Specification. In particular, the difference $B_{delta}(i)$ is computed for current picture i and used to calculate a "target VBR bit rate" $B_{VBR}(i)$ for the current picture i "by second-order feedback control". This target bit rate is then "used to derive the proposed quantizer scale" for the current picture i, $Q'_{VBR}(i)$, according to the equation in paragraph [0062] of the Specification.

No such "target bit allocation for said current picture" determined "by second-order feedback control based on said changes" is disclosed, taught, or suggested in Ribas-Corbera. As described "with reference to flowchart 100 of FIG. 6" (Ribas-Corbera, col. 5, lines 7-8), the quantization step size is computed for a frame in Ribas-Corbera without regards to any changes in average bit rate measured "over time for a current picture". Rather, the quantization step size computed by Equation (3) in Ribas-Corbera depends only on complexity parameters from previous frames and on B_{GOP}, the "total number of bits for a GOP" (Ribas-Corbera, col. 5, lines 24-25). Changes in average bit rate for a current picture are not taken into account.

Furthermore, the "target bit allocation for" a "current picture" in Ribas-Corbera is not affected by any changes in average bit rate measured "over time" for that current picture. In fact, the quantization step size for a current picture (or frame) in Ribas-Corbera is not even computed based on a "target bit allocation for said current picture". The quantization step size for a current picture is derived from a bit allocation for the entire GOP, i.e., B_{GOP}, rather than on a bit allocation for that current picture.

Only "[O]nce the last frame of the GOP has been processed" (Ribas-Corbera, col. 7, lines 47-51), the bit allocation for a GOP, i.e., B_{GOP}, is updated. The updating that takes place is based on B_{AVG}, which is the "[A]verage number of bits for GOP, i.e., B_{AVG}=N R_{AVG}/F" (Ribas-Corbera, col. 5, lines 49-50), and on Speed, which is the "convergence speed" (Ribas-Corbera, col. 6, line 3) of the algorithm described with reference to FIG. 6 of Ribas-Corbera. No changes in average bit rate measured "over time for a current picture" are used to adjust the target bit allocation for

the current picture. The update on B_{GOP} is performed ***after*** the bit allocation for an entire GOP has already been determined.

As shown in FIG. 6 of Ribas-Corbera, the bit allocation for a current picture is determined first in steps 140-150, and only after all the pictures in a GOP have been processed, an update to B_{GOP}, the total number of bits in a GOP, is performed in step 180. This update does not depend on changes in average bit rate for a current picture measured over time and is not used to adjust the bit allocation for that current picture (as shown in FIG. 6, there is no arrow from step 180 going into steps 140-150). The update is also not computed by "second-order feedback control", as demonstrated by the Equations used to process step 180 (Ribas-Corbera, col. 7, lines 47-51).

The claimed invention, in contrast, measures changes in average bit rate for a current picture and only then adjusts the target bit allocation for that current picture by "second-order feedback control". That is, first changes in average bit rate for a current picture are measured and then the bit allocation for that current picture is determined. Ribas-Corbera discloses determining a bit allocation for a current picture without regards to the average bit rate for that current picture and after processing all pictures in a GOP, updating the total number of bits for the GOP based on the average bit rate for the entire GOP.

In short, there is no disclosure, suggestion, or teaching of measuring changes in the average bit rate of an output bitstream of said encoder over time for a current picture" and "adjusting a target bit allocation for said current picture by second-order feedback control based on said changes".

Applicants therefore respectfully submit that Ribas-Corbera does not anticipate Claim 27, as well as Claims 28-29, which respectfully depend there from. Since Ribas-Corbera fails to anticipate the claimed invention of Claims 27, Applicants respectfully submit that Claim 27 and its respective dependent claims, distinguish from, and are allowable over, the cited reference.

Claims 1-6 and 30-32 have been rejected under 35 U.S.C. § 103(a) as being unpatentable by Ribas-Corbera in view of Hanamura et al., U.S. Patent No. 6,654,421 ("Hanamura"), and further in view of Oishi et al., U.S. Patent No. 5,511,054 ("Oishi"). Applicants traverse the rejections. Reconsideration of these claims is respectfully requested.

Applicants respectfully submit that the combination of Ribas-Corbera, Hanamura, and Oishi does not disclose "receiving independent calculations of said first quantization step size and said second quantization step size for the current picture from the VBR video controller and the CBR video controller".

The Examiner has acknowledged that "[T]he Ribas-Corbera rate controller now modified to implement separate VBR/CBR coders as shown by Hanamura and further discussed with regards to established case law, has a majority of the features of the claim, and ***but still fails to disclose a selector configured to switch back and forth between the VBR controller and the CBR controller***". (Office Action, Page 7, emphasis added). The Examiner then suggests that "Oishi discloses a video coding apparatus which discloses a dual VBR/CBR encoding method and includes the use of a switch between the controllers (Oishi: column 10, lines 1-60) in order to allow the multiplexing of both CBR and VBR data (Oishi: column 5, lines 35-50)" (Office Action, Page 7) and that, "given this teaching, it would have been obvious to one of ordinary skill in the art at the time of invention to incorporate Oishi's VBR/CBR switcher into the Ribas-Corbera rate controller ***in order to have the Ribas-Corbera rate controller have the capability to multiplex variable bit rate coded data with constant but rate coded data into one output stream***". (Office Action, Page 7, emphasis added).

Applicants respectfully submit that the Examiner is incorrect in his characterization of Claims 1 and 30. The selector of Claim 1 is not configured to "multiplex variable bit rate coded data with constant bit rate coded data into one output stream" (Office Action, Page 7) as suggested by the Examiner. Rather, the selector of Claim 1 receives "independent calculations" of two step sizes and selects the maximum step size from the two step sizes. There is no disclosure, suggestion, or teaching in the claimed invention that the two step sizes are to be multiplexed.

In addition, Applicants also respectfully submit that the Examiner is incorrect in his characterization of Oishi as disclosing the features of Claims 1 and 30. In particular, Oishi does not disclose receiving "independent calculations of said first quantization step size and said second quantization step size for the current picture from the VBR video controller and the CBR video controller".

Oishi instead discloses "a recording apparatus in which two or more different types of data, such as video and audio data, are multiplexed for recording on a recording medium". (Oishi, Abstract). As shown in FIG. 1 of Oishi, video data is encoded at a variable bit rate with a variable bit rate encoder and audio data is encoded at a constant bit rate with a constant bit rate encoder. "A data multiplexing circuit 7 receives, in an alternating fashion, encoded video data c1 transferred from video code buffer 5 and encoded audio data c2 transferred from the audio code buffer 6. The data multiplexing circuit 7 multiplexes the encoded video data c1 with the encoded audio data c2. A switch 8 that is part of the data multiplexing circuit 7 switches between a first position at which the data multiplexing circuit 7 is connected to receive encoded video data transferred from the video code buffer 5 and a second position at which the data multiplexing circuit 7 is connected to receive the encoded audio data transferred from the audio code buffer 6". (Oishi, col. 6, lines 43-54).

That is, Oishi cannot remedy the deficiencies of Ribas-Corbera and Hanamura because it does disclose, suggest, or teach "receiving independent calculations from" a VBR video controller and a CBR video controller – it only discloses multiplexing audio and video data from a VBR video controller and a CBR ***audio*** controller.

Furthermore, Oishi does not disclose, suggest, or teach receiving "independent calculations" of two step sizes to "select a maximum quantization step size" from the two step sizes. As described above, Oishi alternates between a VBR video controller and a CBR audio controller to receive encoded video and audio data and multiplex them together. There is no selection of one step size from two independently calculated step sizes in Oishi; rather, Oishi discloses receiving two types of encoded data – video and audio – and multiplexing them together instead of selecting "a maximum" between them.

In short, the Examiner still has not provided any evidence of a combination that discloses, teaches, or suggests all of the features of Claims 1 and 30. The combination of Ribas-Corbera, Hanamura, and Oishi fails to teach or suggest all of the elements of independent Claims 1 and 30. Dependent Claims 2-9 and 31-32 are allowable on at least the same basis. Applicants therefore respectfully submit that Claims 1 and 30 and their respective dependent claims, distinguish from, and are allowable over, the cited references.

Claims 10-26 have been rejected under 35 U.S.C. § 103(a) as being unpatentable by Ribas-Corbera, U.S. Patent No. 6,535,251 ("Ribas-Corbera"), in view of Tan et al., U.S. Patent No. 6,542,549 ("Tan"). Applicants traverse the rejections. Reconsideration of these claims is respectfully requested.

Applicants respectfully submit that the combination of Ribas-Corbera and Tan does not disclose determining "an activity-based energy value for each macroblock type indicative of a number of bits required to encode each macroblock type".

The Examiner has acknowledged that "Ribas-Corbera fails to disclose '...a picture analysis module configured to classify macroblocks within a current picture by type, each macroblock type having distinct rate quantization properties...' as in the claims. Tan discloses a video decoder method and apparatus which discloses the use of picture analysis module comprising a video complexity verifier (Tan: column 7, lines 40-67; column 8, lines 1-10) which classifies macroblocks within a current picture by type, each macroblock type having distinct rate quantization properties (Tan: column 11, lines 5-20: rate and quantization properties are used to generate the 'macroblock' type signal)". (Office Action, Page 11).

Applicants respectfully submit that the Examiner is incorrect in his characterization of Tan as disclosing the features of Claims 10 and 16. In particular, Tan does not disclose determining "an activity-based energy value for each macroblock type indicative of a number of bits required to encode each macroblock type".

Tan only discloses classifying the macroblocks by type to determine their complexity. As described in Tan, "[T]he coding types of the macroblocks are used to classify the macroblocks into different categories of complexity. The complexity is then normalised with respect to the simplest type of macroblock, which is given a unit of one macroblock complexity. The remainder categories are given a weight of w times one macroblock complexity where w varies for each of the categories depending on the complexity and is always a value greater than one". (Tan, col. 9, lines 50-58). Tan does not disclose, suggest, or teach using an "activity-based energy value" as a measure of macroblock complexity. The complexity of a macroblock in Tan is determined purely according to its type.

In contrast, the claimed invention discloses calculating "a difference measurement, such as a mean absolute difference (MAD) measure, of each macroblock type as an activity measurement to calculate an energy value indicative of the number of bits required to encode a macroblock type with a given quantizer step size". (Specification, paragraph [0034]). This energy value provides "an approximate indication of image complexity".

Nowhere in the cited references, alone, or in combination, it is disclosed, taught, or suggested that an "activity-based energy value" be computed to determine macroblock complexity. The Examiner has also not provided any evidence of a combination that discloses, teaches, or suggests the calculation of such "an activity-based energy value for each macroblock type indicative of a number of bits required to encode each macroblock type". The lack of disclosure, teaching, or suggestion for providing such an activity-based energy value is a strong indication that doing so was not obvious at the time the invention was made.

In short, the combination of Ribas-Corbera and Tan fails to teach or suggest all of the elements of independent Claims 10 and 16. Dependent Claims 11-15 and 17-26 are allowable on at least the same basis. Applicants therefore respectfully submit that Claims 10 and 16 and their respective dependent claims, distinguish from, and are allowable over, the cited references.

In view of the foregoing amendments, Applicants believe that all rejections are rendered moot, and respectfully submit that the subject application is in condition for allowance. The Examiner is invited to contact the undersigned if there are any residual issues that can be resolved through a telephone call.

The Commissioner is hereby authorized to charge any appropriate fees to Deposit Account No. 50-1283.

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Respectfully submitted,
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